AMERICAN JOURNAL OF PHARMACY

PUBLISHED BY AUTHORITY OF THE

Philadelphia College of Pharmacy

VOL. 88 FEBRUARY, 1916 NO. 2

CONTENTS.

Price, $3.00 per Annum, in advance. Issued in Monthly numbers of not less than 48 pages

SINGLE NUMBERS, 30 CENTS
BACK NUMBERS, 50 CENTS

Address all communications to
The American Journal of Pharmacy, 145 North Tenth Street, Philadelphia.

Entered at the Post Office at Philadelphia as second-class matter

American Journal of Pharmacy

ESTABLISHED IN 1825

Four preliminary numbers were published at different times until in 1829, when the publication of the regular volumes began. Since then the publication has been uninterrupted. During the period from 1829 to 1852 four numbers were published annually, except in 1847, when five numbers were published. From 1853 to 1870 six numbers were published. Since this time twelve numbers have been published annually.

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	2 pp.	4 pp.	8 pp.	16 pp.	COVERS WITH TITLES
25 copies	$2.25	$3.75	$7.75	$9.00	25 copies $1.75
50 "	2.50	4.00	8.25	9.75	50 " 2.00
100 "	2.75	4.25	9.00	10.75	100 " 2.25
250 "	3.75	4.75	10.00	12.00	250 " 2.75

THE AMERICAN
JOURNAL OF PHARMACY

FEBRUARY, 1916

PHARMACOPŒIAL STANDARDS FOR WHISKY AND BRANDY.

By GEORGE M. BERINGER, A.M., PH.M.

The resolutions adopted by the various associations of druggists in favor of the retention of standards for whisky and brandy in the United States Pharmacopœia indicate that this is considered one of the topics in which pharmacists are especially interested.

The question of proper pharmacopœial standards for these distilled liquors has been unnecessarily beclouded by other questions that have been introduced in the discussion.

As the member of the Committee of Revision to whom was referred the subject of standards for whisky and brandy, I am of the opinion that there should be presented, for the benefit of the interests engaged in the discussion, a review of the studies this assignment entailed. Hence I have concluded to publish an abstract of the " Report of the Referee on Whisky and Brandy."

The preparation of a satisfactory monograph on whisky is beset with peculiar difficulties. The referee admits that it has been one of the most perplexing of the many pharmacopœial problems with which he has been personally associated.

Considerable of the literature on the subject has been written in behalf of trade interests engaged in a strenuous effort to obtain commercial advantages, and is so tinctured with partisanship as to becloud the scientific facts necessary for a pharmacopœial standard. The Pharmacopœia *must not become entangled in any such trade controversies.*

The referee believes that it is his duty to present a report that shall be based upon an impartial study of the subject and upon the actual data obtained by examination of commercial products of satis-

factory quality. What is needed is a definition, description, and tests that shall correctly define, cover, and include any properly-produced whisky that may be dispensed when "Spiritus Frumenti" is *prescribed for medical purposes,* irrespective of which cereals were used in the mash or what form of apparatus was used in the distillation, or the State or country where it was produced. Such a standard, to be satisfactory, must be based upon such facts as are fully established, and not upon academic theories or preconceived views.

The following general observations are initial propositions which have a bearing on this question. These must be given due consideration as having a decided influence on the draft of a pharmacopœial standard. They further serve to illustrate some of the difficulties of the problem.

Whisky is of such a complex chemical composition that it is difficult to compass it by the ordinary rules of procedure of the pharmacopœia. Approximately, about 99 per cent. of whisky is a mixture of ethyl alcohol and water which our accepted methods enable us to determine with sufficient accuracy. The remaining 1 per cent. or less consists of non-volatile extractives and numerous volatile constituents of complex and more or less unknown composition and present in ever-varying proportions. The presence of these volatile substances, which in the more recent literature have been named "congeners," in at least a substantial amount is essential to whisky.

The causes of congeneric variation are numerous. The various mixtures and quality of the grains used and the proportion of diastase in the mash, the character of the yeast, the time and temperature of the fermentation, the method of distillation, the distilling apparatus, and even the atmospheric conditions are factors permitting of innumerable changes and consequently innumerable variations in the amount and character of the congeners present in the product.

It is difficult to gauge the degree to which rectification and compounding have been carried on, or to what extent these should be restricted. For several centuries the trend of the manufacture of whisky has been toward either the masking of, or the elimination of a portion of, the congeners. The earlier attempts to render distilled spirits potable were efforts to overcome or drown out the obnoxious odor and taste in the crude distillates of those days by

the addition of aromatic and sweetening flavorings in relatively large amounts.

These attempts at masking were soon supplanted by improved methods of manufacture that aimed at the elimination of a large portion of the congeners produced. The first step to be applied in the process of elimination was fractionating the distillate by which the aldehydes and " fusel oil " congeners were largely separated in the rejected fractions. In the whisky industry, as in other industries, marked progress has taken place in the character of apparatus and machinery employed. In modern distilleries the improved column still has generally replaced the older types of stills.

The second step in the progress of elimination of " fusel oil " congeners is rectification. Originally, this was carried on as a distinct industry in an establishment entirely separate from the distillery. Rectification originally consisted in passing the grain distillates through a series of leaching tubs containing charcoal. Since 1872 the government has sanctioned, by congressional enactment, the use of improved apparatus by which the rectification may be carried on at the distillery as a part of the process of manufacture, thus combining in one completed operation both the distillation and the rectification.

During all of these years the effort has been to eliminate as much of the higher alcohols, " fusel oil," as possible. The tendency of the manufacture of whisky has been gradually but surely toward the production of a " lighter " or milder type of distilled spirit from grain, and the taste of the public has been cultivated in that direction.

The taste of the public has likewise been cultivated toward the modified flavors produced by " blending," in which the art of the compounder is exhibited. It is estimated that probably 90 per cent. or more of the whisky consumed is blended or mixed grain distillates.

In its standard, the United States Pharmacopœia must necessarily recognize the changes that have occurred in the character of the product known as whisky because of improved apparatus and processes, changes in trade conditions, and the demands of cultured palates. Its standard must, of necessity, define what is actually in the market and what is used in medical practice, and not what was originally known as whisky or the primitive " usquebaugh."

It is likewise difficult to gauge the changes due to the aging or maturing of whisky and to determine the proper minimum age limit.

It may be considered as universally conceded that the palatability of whisky is improved by, if not mainly due to, changes which occur during the period of maturing or storing. To what modification of its components or to the production of which " secondary products " this improvement is due cannot be definitely stated.

The changes that take place during the aging are, as yet, but imperfectly known. However, we do know something of these and of their effect on the potability of the whisky. The distilled spirit dissolves out of the wood a small amount of tannin, wood extractive, and color, and acquires a distinct woody flavor, detectable by both taste and smell. The color and flavor are materially influenced by the extent of the charring of the interior of the barrel, and the wood extractive is increased by elevating the temperature, by agitating the barrels, and by extending the period of storage. In whisky that has been matured in oak barrels, the woody flavor is not only distinctly perceptible in the liquid but persists in the residue left on evaporating a portion on the water-bath. The tannin, wood extractive, and coloring thus acquired are undoubtedly *additions* to the distilled spirit, but, by reason of the many years that this practice of storing in wood has been carried on, these have become considered as *essential ingredients,* and the associated woody flavor is accepted as part of the composite flavor of whisky.

The percentage of acid present in whisky at the time of its distillation is variable, depending on the extent to which the fermentation has been carried. During the period of storage the acidity is increased for several years by the gradual oxidation of a portion of the alcohol and thereafter appears to remain stationary. Esterification is likewise gradually going on during the maturing period, and the acids consumed in this process probably compensate that which is continuously formed by oxidation. The esters formed play an important part in modifying the odor and taste of the product.

Chemists estimate the acids present as acetic acid and the esters as acetic ether. Nevertheless, it is well known that other acids are present in small amounts and also that a series of higher alcohols, collectively spoken of as " fusel oil," are present in relatively minute quantities, and that these are subject to the same chemical changes as is the acetic acid and the ethyl alcohol; consequently the production of a number of compound ethers must be conceded. These acids and esters aid materially in rendering the spirit potable by

adding the flavor or bouquet thereto, and, although strictly *additions,* they are considered as *essential ingredients* of whisky.

The Federal laws relating to distilled spirits have been enacted primarily for the purpose of collecting the tax thereon, and only incidentally do they consider the question of standards. From the viewpoint of the revenue collector, the tendency would be to encourage the production and to broaden the definition of whisky so as to include the widest range of alcoholic distillates that could be used under that title. The pharmacopœial viewpoint is the necessity of fixing a reasonable and practical standard of purity and quality for a product used for medical purposes.

For beverage purposes a wider latitude could with safety be permitted than would be permissible in a standard for a medicinal article. The requirements for whisky as a medicine should be more restricted and exacting, as in such use there is constantly present the necessity for estimating its pharmacodynamic action. With beverages the pharmacopœia is not concerned, nor does its authority contemplate the control of standards for such purposes. For this reason there should be incorporated in the monographs on Whisky and Brandy a statement that the standards are applicable to these products when prescribed for medical use.

The pharmacopœial standard should be correct, reasonable, and practical, and should work no unnecessary hardship on the producer and should protect the pharmacists from uncalled-for prosecutions. The manufacture of whisky is a legalized industry commonly conducted on a very large scale and with enormous investments. The quantity of whisky consumed as a medicine bears but a very small ratio to the total production. The pharmacist is limited in his source of supply, and, even under the most favorable conditions, he can have little or no influence on the quality of the commercial product.

It is exceedingly rare for the physician, in prescribing whisky, to specify any brand, kind, or age. Rarely does he write more specifically than for "Spiritus Frumenti," thus casting the responsibility entirely upon the pharmacist, who in turn relies upon his source of supply, the wholesale druggist or the wholesale liquor dealer. Under the law, the pharmacist is responsible for the quality of the medicines that he dispenses. The duty of the pharmacopœia is to supply a proper standard that will not unnecessarily restrict his supplies and will enable him to form a correct judgment of the purity and quality, so as to protect the dealer and consumer from

deception. "Such a standard should be sufficiently liberal to enable compliance without becoming burdensome, but at the same time constitute a safeguard against the use (medically) of the compounds commonly sold under the name of whisky."

Accepting the monograph on Spiritus Frumenti of the U. S. P. VIII as the basis for a revised monograph for the U. S. P. IX, a critical examination of the language and statements contained in the article on whisky now official appears to be imperative. Equally important is the confirmation of these statements by the results of examinations of commercial products. Attached to this report is a synopsis of recent examinations of nearly two-score samples of commercial whiskies. This serves to illustrate some of the criticisms presented.

THE TITLE.—"Spiritus Frumenti," literally "spirit of grain," is appropriate and should be retained.

THE DEFINITION.—"An alcoholic liquid obtained by the distillation of the mash of fermented grain—such as Indian corn, rye, wheat, and barley, or their mixtures."

This is subject to several criticisms. Whisky must be *potable*, and "an alcoholic liquid obtained by distillation" as prescribed is not the whisky contemplated until rendered *potable* by reduction to the proper alcoholic content and matured, and this distinction should properly be included in the definition.

As it is the mash that is fermented, the wording should be changed from "mash of fermented grain" to "*fermented mash of* ——"

The minimum period of aging should be a *requirement* of the definition and *not a recommendation* included in the description, and accompanying such a statement in the definition should be added such restrictions on the method of aging as it may be deemed wise to officially require.

THE DESCRIPTION.—"An amber-colored liquid, having a distinctive odor and taste, and a slightly acid reaction."

The statement as to color is probably as clear and descriptive as it can be made, as the varying depths of color or shades of amber permissible cannot be described, and colorless distillates are excluded.

The statement here as to acidity is likewise accepted.

The statement, however, regarding odor and taste is subject to

the criticism of being too general and too indefinite a description of the odor and taste of whisky. It might be claimed that the "distinctive odor and taste" is the distinctive odor and taste of ethyl alcohol, which is the predominating ingredient. I would recommend that this be modified to read—"having the odor and taste of diluted alcohol, modified by flavors derived from the grain, extractives from the wood and substances naturally formed during the storage."

> "Its specific gravity should be not more than 0.945 nor less than 0.924 at 15.6° C. (60° F.), corresponding, approximately, to an alcoholic strength of 37 to 47.5 per cent. by weight or 44 to 55 per cent. by volume of absolute alcohol."

This statement follows the customary method of determining the alcoholic content of such distilled spirits by taking the specific gravity of the liquid by any of the accepted ways and calculating from the alcohol table the percentage of alcohol present. This ignores the variation introduced by the content of solids and the modifying influences of the other volatile substances present. This error is certainly very slight and, with the restrictions on solids proposed, will be reduced to a minimum that is negligible, and, as the method has the sanction of governmental and business usage, it can be continued.

The permissible alcoholic content, "44 to 55 per cent. by volume," is entirely too wide a range for a medicinal product. A whisky of 110 proof is entirely too strong for consumption and verges on the border of being non-potable on that account. A number of the samples examined (notably Nos. 13, 14, 15, and 16) were stored goods not yet reduced, and the taste of these showed distinctly the undesirability of such high alcoholic content. The bulk of the whisky is sold to the consumer at 90 to 100 proof (45 to 50 per cent. alcohol by volume), and the pharmacopœial range of alcohol content should not vary greatly therefrom. From 45 to 51 per cent. would be a proper limitation.

The present method of stating gravity at the temperature of 15.6° C. is continued in the monograph submitted, although the preference of the referee would be to give this at the official normal temperature.

TESTS.—"If 100 Cc. of whisky be very slowly evaporated in a tared dish on a water-bath, the last portions volatilized should not have a harsh or disagreeable odor (absence of more than a trace of *fusel oil* from grain); and the residue, when dried at 100° C. (212° F.), should not weigh more than 0.5 Gm. This residue should have no sweet or distinctly spicy taste (absence of *added sugar, glycerin,* and *aromatic substances*), and it should almost completely dissolve in 10 Cc. of cold water, forming a solution which is colored not deeper than light green by a few drops of ferric chloride T. S. diluted with 10 volumes of water (absence of more than traces of *oak tannin* from casks)."

This paragraph contains some misleading statements and merits the most critical scrutiny. The first statement therein is given as a test for the absence of more than traces of fusel oil. This is only one of the organoleptic tests that have been proposed for detecting fusel oil. It is comparable with the evaporation of a portion of the spirits by rubbing on the palm of the hand or evaporation on a piece of bibulous paper, and is unscientific and insufficient for the purpose proposed. Relatively large amounts of fusel oil would escape detection by such a crude method.

If only a qualitative method is to be adopted for the detection of excess of fusel oil, there are several tests which are preferable; for example, either of the following:

1. 20 Cc. of the sample mixed with 50 Cc. of distilled water in an Erlenmeyer flask and heated to 25° C., the contents then violently shaken and the odor and taste noted.

2. Shake 10 Cc. of the sample with 20 Cc. of water and 10 Cc. of ether. Allow the mixture to stand, separate the ether layer, and evaporate this on a watch crystal. No odor of fusel oil should remain after the ether has evaporated.

If it is desirable to retain only one qualitative test for this purpose, I would prefer the latter.

In the Eighth Revision of the U. S. P. the residue from 100 Cc. of whisky was increased from 0.25 Gm. to 0.5 Gm. The reason for this change is not evident. Properly-made whiskies, even after long storage in wood, do not yield residues approaching this maximum. Blended whiskies and compounded whiskies, to which ex-

cesses of coloring and flavoring have been added, may yield a residue of 0.5 Gm. or even greater.

Sample No. 13, which was stored more than six years in wood, yielded only 0.260 Gm., and if reduced to 50 per cent. alcoholic strength the residue would have fallen below 0.250 Gm.

Sample No. 26, after six years' storing, residue 0.210 Gm.

Sample No. 6, seven years old, residue 0.233 Gm.

Of the blended whiskies, which contained added coloring and flavoring, the residues frequently exceeded 0.5 Gm. This is seen in Samples Nos. 19, 20, and 33.

With entire safety the residue from 100 Cc. of whisky can be reduced to 0.3 Gm., or even to the old standard of 0.25 Gm. Any whiskies exceeding this limit would show the presence of added foreign materials.

The residue also gives us valuable information as to the character of the whisky. In a whisky consisting entirely of grain distillates aged in wood the residue is brown in color, dry, and scattered over the bottom of the evaporating dish in leaf-like patterns or spotted deposits. Whiskies containing added caramel coloring leave a more or less shining, deep-brown residue. If only a small amount of caramel is added it is insufficient to entirely destroy the characteristic appearance of the residue described above, and the residue exhibits in spots the characteristics of both kinds of coloring. If the coloring is entirely caramel, or if the caramel is in excess, then the residue is in the form of a shining, smooth solid extract more or less pasty and sweet, especially if prune juice or similar material has been used as a flavoring.

The requirement that the "residue should have no sweet or distinctly spicy taste (absence of *added sugar, glycerin,* and *aromatic substances*)" is correct and should be retained.

The next requirement, however, that "it should almost completely dissolve in 10 Cc. of cold water," is not correct. In compounded whiskies in which the residue is composed largely of added coloring and flavoring the residue is practically entirely soluble. However, in whiskies in which the residue is due to material absorbed from the wood during storage, this is not true. A reference to the appended report will show that in those whiskies which are compounded the *insoluble residue* is very scant. In the examination of these samples the insoluble portion of the residue was determined in a number of cases. The residue left on evaporation was thoroughly rubbed down

with 20 Cc. of distilled water, filtered, and the dish and filter washed with an additional 5 Cc. of water. In a number of these samples the *insoluble residue* amounted to from *19 to 40 per cent. of the* residue. This statement must be either eliminated or amended to comply with the facts.

Exception must likewise be taken to the next statement, that the solution of the residue in water " is colored not deeper than light green by a few drops of ferric chloride T. S. diluted with 10 volumes of water." In all whiskies which are aged in wood for four years or more sufficient of the wood tannin is absorbed to give in this test a distinct greenish-black coloration. In compounded whiskies this color is usually brown, with little or no distinct green tint. The pharmacopœial statement, instead of being a negative one, should be a positive one, requiring that the solution of the residue *must yield a green coloration* on the addition of ferric chloride T. S., as an evidence of the proper maturing of the whisky by storage in wood. The limitation on the amount of residue will eliminate the possibility of an excessive amount of tannic acid.

> " If 50 Cc. of whisky be shaken vigorously in a stoppered flask with 25 Gms. of kaolin, and, after standing half an hour, be filtered, the color of the filtrate should not be much lighter than that of the whisky before treatment."

Exception is taken to this test for caramel. If kaolin of proper absorptive test be used in the quantity directed, the result will be a magma from which very little liquid can be filtered. If the test be retained, then it should be changed, directing 5 Gms. kaolin to 50 Cc. of whisky. It is to be noted that a *slight reduction* in the coloring occurs with all samples of whisky.

The color in whisky is due to added coloring, either caramel or that dissolved from the charred barrel. The use of caramel antedates by many years the use of the charred barrel for this purpose. Either of these colorings is harmless, and their use has been sanctioned by Federal statutes and decisions. If the entire residue consisted of coloring, it would not amount to more than from 0.2 to 0.3 per cent. Since the amber color is required, it is immaterial if this color be produced by the addition of small quantities of burnt sugar or of a similar coloring substance prepared by charring wood. The quantity of either of these present in whisky answering the pharmacopœial requirements would be exceedingly small. Since both

are harmless and the use of caramel is provided for by laws and regulations of the government, I doubt the wisdom of the Pharmacopœia adopting a provision that would exclude caramel from whisky and raising an issue between its standard and the government enactments. My recommendation is, that this paragraph relating to test for caramel be eliminated from the pharmacopœial tests.

> "To render 100 Cc. of whisky distinctly alkaline to litmus, not more than 1.2 Cc. of normal potassium hydroxide V. S. should be required (limit of *free acid*)."

A compound whisky with practically no acid or an immatured whisky would meet this requirement, as no minimum limitation is fixed. On the other hand, some very good grades of whisky may slightly exceed this percentage of acid. (Note samples Nos. 21, 22, and 23.) It is to be noted that the compounded and blended whiskies are exceedingly low in acid content, as, for example, samples Nos. 32, 33, 37, and 39. A minimum and a maximum limit should be given, and the maximum might with safety be somewhat increased.

The method of applying this test is misleading. On adding solution of potassium hydroxide to whisky the amber color is deepened and it is difficult to note the end reaction. Litmus is not a good indicator for the purpose. I would recommend that in stating this test 100 Cc. of whisky be diluted with 200 Cc. of distilled water and the titration be made with tenth-normal potassium hydroxide V. S., and that phenolphthalein T. S. be used as indicator. The reaction is far more distinct under these conditions than would be possible with the present directions.

To meet the criticisms and comments as submitted above, the following monograph is reported:

Spiritus Frumenti.

WHISKY.

A potable alcoholic liquid obtained by the distillation of the fermented mash or mashes of cereal grains (wholly or in part malted)—such as maize, rye, wheat, and barley, or their mixtures. Whisky intended for administration as a medicine should have been stored in wood containers for a period of not less than four years before it is used, and should conform to the following characters and tests.

An amber-colored liquid, having the odor and taste of diluted

alcohol modified by flavors derived from the grain, substances extracted from the wood or naturally formed during the storage, and a slightly acid reaction.

Its specific gravity should be not more than 0.943 nor less than 0.932 at 15.6° C., corresponding, approximately, to an alcoholic strength of 38 to 43.5 per cent. by weight or 45 to 51 per cent. by volume of absolute alcohol. (See Appendix, Alcohol Tables, page —.)

Shake thoroughly 20 Cc. of whisky, 20 Cc. of distilled water, and 10 Cc. of ether; allow the mixture to stand until separation has taken place. Separate the ether layer and allow it to evaporate spontaneously on a watch crystal; the residue should not have a disagreeable or irritating odor (excess of *fusel oil*).

Evaporate 100 Cc. of whisky in a tared dish on a water-bath and dry the residue at 100° C. to constant weight; it should weigh not more than 0.3 Gm. This residue should not have a distinctly sweet or spicy taste (absence of *added sugar, glycerin,* and *aromatic substances*). If the residue be treated with 10 Cc. of cold distilled water, the filtered solution should give a greenish-black coloration upon the addition of a few drops of diluted ferric chloride T. S. (1 in 10) (*oak tannin* from barrels).

100 Cc. of whisky diluted with 200 Cc. of distilled water should require for neutralization not less than 6 Cc. nor more than 15 Cc. of tenth-normal potassium hydroxide V. S., using phenolphthalein T. S. as indicator (limit of *free acid*).

Brandy.

The statements in the preceding part of the report, although written on the subject of whisky, apply with almost equal force to the subject of brandy. A few additional comments, however, are necessary upon a proper monograph for brandy.

Title.—The pharmacopœial title, Spiritus Vini Gallici, has been retained in the United States Pharmacopœia and in the British Pharmacopœia. As it is not the intent to restrict the brandy of the Pharmacopœia to French brandy only, "Gallici" should be taken out of the title. For the same reason, the synonym, Cognac, should not be given in the Pharmacopœia. A change in the pharmacopœial title evidently is necessary. The Austrian Pharmacopœia restricts its brandy to the cognac, and takes as the title, Spiritus Vini Cognac. The German Pharmacopœia and the Swiss each takes as titles,

Spiritus e Vino," with "Kognac" and "Cognac" as synonyms. Neither of these seems to be acceptable for the U. S. P.

It has been suggested that the title be made Spiritus Vini, but this is very objectionable, because the title, Spirit of Wine, is commonly applied to alcohol, and its adoption for brandy would lead to serious confusion. Chairman Diehl has suggested as a title, Spiritus Vini Vites Viniferæ. This title appeals to me, but we are confronted by the fact that the *Vitis Vinifera* and its cultivated varieties are not the only grapes from which brandy is made. The American species, *V. Labrusca* and *V. æstivalis,* and cultivated varieties are also sources from which many wine grapes are now cultivated. For this reason, the validity of the title suggested by Chairman Diehl may be questioned.

Your referee is of the opinion that a distinctive title should be coined for brandy that would designate it as a spirit of grape wine, and would not restrict brandy to that produced in any one country or district or that from any one grape. This leads to a suggestion that the title be made Spiritus Vini Vitis.

It is well known that French brandy has always been colored with caramel, and that a special syrup of sugar partly caramelized is used for this purpose. The Austrian Pharmacopœia and the Swedish Pharmacopœia, recognizing this fact, permit in their official brandy, which is cognac, a residue of 1.5 per cent. The U. S. P. of 1890 likewise permitted a residue of 1.5 per cent., and none of these pharmacopœias have tests that would exclude the presence of caramel. The U. S. P. VIII reduced the allowable residue to 0.5 Gm. in 100 Cc., and included the kaolin test for the presence of caramel coloring. In the list of Additions and Corrections promulgated by the Committee of Revision on May 1, 1907, the caramel test was deleted. It is difficult to understand why the U. S. P. VIII should attempt to preclude the use of the finer types of French brandy by restricting the solid content, and likewise why, after having once recognized the error of the caramel test and deleted it from the U. S. P. VIII, it should be proposed to now reincorporate this test in the U. S. P. IX.

The following monograph with the proposed title is respectfully submitted:

Spiritus Vini Vitis.

BRANDY.

A potable alcoholic liquid obtained by the distillation of the fermented unmodified juice of fresh grapes. Brandy intended for

A Synopsis of Some Recent Examinations of Distilled Spirits.

Number	Label and locality	Sp. gr. 15.6 C.	Alcohol, per cent. by volume	Color	Color after treating with kaolin	Residue from 100 C.c. in Gm.	Character of residue	Residue soluble in Gm.	Residue insoluble in Gm.	Aqueous solution of residue with $FeCl_3$	Acidity 100 Cc. required N/10 KHO in Cc.
1	Neutral spirit from grain, Cincinnati, Ohio	0.8113	96.1	Colorless	.....	0.005	.....	.....	.....	.....	0.7
2	Grain neutral spirit, Peoria, Ill.	0.8122	95.8	Colorless	.....	0.004	.....	.....	.....	.....	0.5
3	Grain neutral spirit, Peoria, Ill.	0.8099	96.5	Colorless	.....	0.004	.....	.....	.....	.....	0.6
4	Grain neutral spirit, New York, N. Y.	0.8142	95.4	Colorless	.....	0.007	.....	.....	.....	.....	0.9
5	WHISKIES: Blend A, No. 1 Bourbon, Louisville, Ky.	0.9496	41.5	Amber	Very light amber, nearly decolorized	0.126	Glossy and spotted, faint woody odor, caramel taste	Almost completely	Scant	Brown, scarcely green	5.5
6	R. Co., I. H. Brand, Louisville, Ky., 7 years old	0.9270	53.5	Amber	Only slight reduction of color	0.233	Spotted, dry, brown, woody odor and taste	Only partly	Decided	Green-black	12.3
7	R. Co., I. H. Brand, Louisville, Ky., 5 years old	0.9245	55.	Amber	Only slight reduction of color	0.183	Spotted, dry, brown, woody odor and taste	Only partly	Decided	Green-black	11.
8	R. Co., I. H. Brand, Louisville, Ky., 3 years old	0.9350	49.5	Amber	Only slight reduction of color	0.155	Spotted, dry, brown, woody odor and taste	Only partly	Decided	Green-black	9.5
9	R. Co., I. H. Brand, Louisville, Ky., 2 years old	0.9320	51.	Light amber	Only slight reduction in color	0.175	Spotted, dry, brown, woody odor and taste	Only partly	Decided	Greenish	10.
10	*A*, rye; *B*, D. Co., Louisville, Ky.	0.9430	45.5	Amber	Reduction decided about ½	0.343	Glossy, gummy, caramel-like, sweet	Nearly entirely	Scant residue	Greenish-brown	7.6
11	*A*, Bourbon; *B*, D. Co., Louisville, Ky.	0.9422	46.	Amber	Reduction decided about ½	0.325	Glossy, taste caramel-like, sweet	Nearly entirely	Residue scant	Greenish-brown	6.8
12	*B*, Bourbon; *B*, D. Co., Louisville, Ky.	0.9419	46.	Amber	Reduction very decided, about ⅔	0.335	Glossy, gummy, caramel-like	Partly	Residue scant	Greenish-brown	4.1
13	T. Co., double distilled pure rye whisky, Pittsburgh, Pa., 6 years old	0.9150	59.	Deep amber	Only slight reduction	0.260	Spotted, dry, brown, woody odor and taste	0.220	0.040	Greenish-black	12.2
14	T. Co., double distilled pure rye whisky, Pittsburgh, Pa., 5 years old	0.9230	55.5	Amber	Only slight reduction in color	0.190	Spotted, dry, brown, woody odor and taste	0.140	0.050	Greenish-black	10.2

15	T. Co., double distilled pure rye whisky, Pittsburgh, Pa., 4 years old	0.9240	55.	Amber	Only slight reduction in color	0.210	Spotted, dry, brown, woody odor and taste	0.146	0.064	Greenish-black	12.
16	T. Co., double distilled pure rye-whisky, Pittsburgh, Pa., 3 years old	0.9242	55.	Amber	Only slight reduction in color	0.190	Spotted, dry, brown, woody odor and taste	0.133	0.057	Greenish-black	11.7
17	T. Co., double distilled pure rye whisky, Pittsburgh, Pa., 2 years old	0.9291	52.5	Amber	Only slight reduction in color	0.135	Spotted, dry, brown, woody odor and taste	0.075	0.060	Greenish-black	9.3
18	T. Co., double distilled pure rye whisky, Pittsburgh, Pa., 6 months old	0.9340	50.	Amber	Only slight reduction in color	0.105	Spotted, dry, brown, woody odor and taste	0.089	0.016	Greenish-brown	9.6
19	Blended whisky, C. Co., Baltimore, Md.	0.9423	45.5	Dark amber	Reduction very marked	1.700	Glossy, gummy, sweet, fruity	1.640	0.060	Brown only faintly green	10.6
20	Blended whisky, C. Co., Baltimore, Md.	0.9438	45.	Dark amber	Reduction very marked	1.65	Glossy, syrupy, fruity	1.630	0.020	Brown, only faintly green	12.
21	Eastern rye, New York, 4½ years old	0.9203	57.	Amber	Reduction only slight	0.245	Spotted, dry, brown, woody odor and taste	0.180	0.065	Green-black	16.2
22	Eastern rye, New York, 3½ years old	0.9228	56.	Amber	Reduction very slight	0.290	Spotted, dry, brown, woody odor and taste	0.220	0.070	Green	15.6
23	Eastern rye, New York, 2½ years old	0.9294	52.5	Amber	Reduction scarcely noticeable	0.230	Spotted, dry, brown, woody odor and taste	0.175	0.055	Green	15.2
24	Eastern rye, New York, 1½ years old	0.9280	53.	Amber	Reduction scarcely noticeable	0.167	Spotted, dry, brown, woody odor and taste	0.127	0.040	Green	11.3
25	Eastern rye, New York, 6 months old	0.9323	51.	Pale amber	Reduction scarcely noticeable	0.107	Spotted, dry, brown, faintly woody odor and taste	0.082	0.025	Light green	8.
26	H, pure rye, Ohio, 6 years old	0.9114	61.	Amber	Reduction very slight	0.210	Spotted, dry, brown, woody odor and taste	0.145	0.065	Green-black	13.3
27	H, pure rye, Ohio, 5 years old	0.9179	58.	Amber	Reduction very slight	0.202	Spotted, dry, brown, woody odor and taste	0.153	0.049	Green	11.6
28	H, pure rye, Ohio, 4 years old	0.9203	57.	Amber	Reduction not appreciable	0.195	Spotted, dry, brown, woody odor and taste	0.139	0.056	Green	11.2
29	H, pure rye, Ohio, 3 years old	0.9252	54.5	Amber	Reduction not appreciable	0.150	Spotted, dry, brown, woody odor and taste	0.102	0.048	Green	10.2
30	H, pure rye, Ohio, 2 years old	0.9292	52.5	Amber	Reduction not appreciable	0.155	Spotted, dry, brown, woody odor and taste	0.119	0.036	Green	9.9
31	H, pure rye, Ohio, 1 year old	0.9297	52.25	Pale amber	Reduction not appreciable	0.125	Spotted, dry, brown, woody odor and taste	0.083	0.042	Green	10.6

A SYNOPSIS OF SOME RECENT EXAMINATIONS OF DISTILLED SPIRITS.—*Continued.*

Number	Label and locality	Sp. gr. 15.6 C.	Alcohol, per cent. by volume	Color	Color after treating with kaolin	Residue from 100 C.c. in Gm.	Character of residue	Residue soluble in Gm.	Residue insoluble in Gm.	Aqueous solution of residue with $FeCl_3$	Acidity 100 Cc., required N/10 KHO in Cc.
32	Blend, S. Co., Cincinnati, Ohio	0.9430	45.5	Deep amber	Greatly reduced, approximately ½	0.115	Glossy, brown, odor slightly woody, caramel taste	0.095	0.020	Greenish-brown	4.
33	Blend, S. D. Co., Cincinnati, Ohio	0.9387	48.	Deep amber	Greatly reduced approximately ½	0.530	Glossy, only very slightly, woody, gummy, sweet, fruity	.0510	0.020	Dirty brown, faintly green	5.1
34	Blend F, New York	0.9424	45.7	Dark amber	Greatly reduced, approximately ½	0.465	Glossy, brown, sweet, fruity and caramel-like	0.440	0.025	Dirty brown, faintly green	7.
35	Blend A, No. 1, Bourbon, Louisville, Ky.	0.9462	43.5	Amber	Greatly reduced approximately ½	0.270	Glossy, slightly bitter, caramel-like	0.255	0.015	Brown, scarcely any green tint	4.3
36	Malt, New York	0.9459	44.	Very pale amber	Almost colorless	0.034	Almost odorless and tasteless	0.029	0.005	Pale green, scarcely any precipitate	1.8
37	Rye in bulk, bought from wholesale liquor dealer on druggists's order for whisky, Philadelphia	0.9445	44.5	Deep amber	Decided reduction, approximately ½	0.452	Glossy, spicy, fruity, sweet	0.447	0.005	Scarcely any precipitate and only faint trace of green	2.3
38	Rye whisky, 4 years old, supplied by wholesale druggist on a retailer's order, Philadelphia	0.9395	47.7	Amber	Slight reduction	0.208	Brown, part glossy and part spotted	0.158	0.050	Green-black	11.5
39	P. blend, supplied by wholesale druggist on order of retailer, Philadelphia	0.9410	46.5	Amber	Greatly reduced at least ½	0.482	Glossy, gummy, hygroscopic, fruity	0.477	0.005	Not green, no distinct change	3.8
40	Philadelphia rye whisky, supplied by a wholesale druggist on order of a retailer	0.9437	45.	Amber	Decided reduction, at least 1/3	0.500	Partly, glossy, gummy, faintly woody	0.460	0.040	Greenish brown	14.1

administration as a medicine should have been stored in wood containers for a period of not less than four years before it is used, and should conform to the following characters and tests:

A pale amber-colored liquid, having the odor and taste of diluted alcohol modified by the flavor derived from the grape wine, substances extracted from the wood or naturally formed during the storage, and a slightly acid reaction.

Its specific gravity should not be more than 0.938 nor less than 0.926 at 15.6° C., corresponding, approximately, to an alcoholic strength of 41 to 46 per cent. by weight, or 48 to 54 per cent. by volume of absolute alcohol (see Appendix, Alcohol Tables, page —).

Shake thoroughly 20 Cc. of brandy, 20 Cc. of distilled water and 10 Cc. of ether, allow the mixture to stand until separation has taken place. Separate the ether layer and allow it to evaporate spontaneously on a watch crystal, the residue should not have an unpleasant or irritating odor (excess of *fusel oil*).

Evaporate 100 Cc. of brandy in a tared dish on a water-bath and dry the residue at 100° C. to constant weight; it should weigh not more than 1.5 Gm. Treat this residue with 10 Cc. of distilled water and filter; the solution should give a greenish-black coloration upon the addition of a few drops of diluted ferric chloride T. S. (1 in 10).

100 Cc. of brandy diluted with 200 Cc. of distilled water should require for neutralization not more than 15 Cc. of tenth-normal potassium hydroxide V. S., using phenolphthalein T. S. as indicator (limit of *free acid*).

THE FUTURE OF PHARMACY IN AMERICA.

By C. Ferdinand Nelson, Associate Professor of Physiological Chemistry, University of Kansas, School of Pharmacy.

Progress has always been, and probably always will be, the watchword of and the criterion for healthy advance in all forms of human activity. By means of it we may measure the evolution or decadence of peoples, nations, states, institutions, professions, creeds, or any other of the thousands of forms which our common life assumes. It is the barometer of life, both for the individual and the group, and as such furnishes the data necessary for determining just where the present finds us and in which direction the future points. In the light of this criterion, then, let us examine the *status*

quo of American pharmacy. Using this as a standard, let us measure our advance to see just where we stand and what the future has in store for us.

It might better serve our purpose, in order to get the matter before us specifically, to ask, and then, if possible, to answer, the following questions: First, has the profession of pharmacy in America made any significant strides forward? Has it kept pace with its sister profession, medicine? If not, then why not? And, secondly, are there any means by which it can attain to what we may truly consider as its own?

When we begin to study the former of these questions soberly and conscientiously one is at the very outset impressed with the extreme complexity as well as the tremendous variability of the factors involved in its solution. And yet this complexity must not deter us. We shall find, upon closer examination, that there appear several legitimate generalizations, whose truth we cannot question and to whose solution we must bend our best efforts.

If the whole question were to be disposed of in a single sentence, most of us would have to answer it in the negative and flatly say, No. Pharmacy in America has not made the progress it should have made, and it has not kept pace with allied professions. Now, Why?

First of all, because the retail drug store in America to-day is a professional anomaly, a business anomaly, a quasi-something, a definite nothing. It has no unity; it does not know its mission; it does not truly serve the public as it should; it divides its attention between business and something that is not business. If it serves at all, it is only in Milton's sense when he says, "They also serve who only stand and wait."

The reasons for this double or multiple life of our drug stores lie largely in fortuitous circumstances that could undoubtedly not be helped; certainly the retail druggist of this generation is not entirely responsible. The retrogression has been slow and unconscious, but in it we find a very good reason why we have not made the progress we should have made.

On the other hand, when we come to examine our progress along educational lines we find, to be sure, evidences of distinct and constant advance. Twenty-five years have seen an increase in preliminary education of from no requirement at all to one year of high school. Again, it must be admitted that State boards of phar-

macy are becoming increasingly more exacting, both in the character of the examinations required and in the length of service demanded in order to practise. *But for each advance along these lines we have retrogressed doubly in our actual retail practice.*

To make this point clear, let us inspect the average retail store of to-day. Remove the signs from the windows and over the door; take out the window display, or, if you please, leave that be where it is. You are now quite sure that you are about to enter either a cigar store, an ice-cream parlor, a cafeteria, or a painting or decorating establishment. These are all legitimate and honorable places of business, each eminently proper and necessary, but they are not drug stores. The pharmacist has spent four years of time only to be permitted to do what other people often do far better without any training. No one can be expected to keep actively and adequately interested in such widely-differing fields, and yet the modern druggist is actually making the attempt. The results may easily be anticipated. The druggist easily quotes you the latest prices on sugar, chocolate, white lead, or linseed oil, but not a single item, unless it be advance in price of a drug or chemical, on the recent advances in his avowed calling. In this extreme commercialism we find a second reason why we have not advanced as we should. The blame is not entirely with the retail druggist, but that does not alter conditions in the least.

And now let us look at the inside of the store. What does one find here, time and time again? Look over the list of bottles, tinctures, and saltmouths, and see how absurdly impracticably they are still chosen. Acetanilid comes first, arsenious acid next, both equally important, no regard for their relative toxicity. Then you read Tr. Aconite, Tr. Arnica, not quite as dangerous a combination because both are not used internally, but bad enough. Then probably Tr. Leptandra, Tr. Krameria, Tr. Kino, Cocculus Indicus, Crocus Martis, Po. Cusso, etc., things out of date, never used, but gloriously exhibited. It seems as if some bottle manufacturer made out a list fifty years ago and we still insist on using it, subject only to a few individual preferences.

Run down the list of roots, barks, and pressed herbs and see the splendid museum exhibits going to waste. Go to the fluidextract and pill cases and count the endless relics of the past. The average pharmacist never "cleans house" or prunes his stock. Things are good forever. Why wouldn't it be a splendid idea to develop a

"museum department" in our drug stores and every so often add a few aged barks, roots, and pills to the collection? Why not have the American Pharmaceutical Association collaborate with the American Medical Society to get out a volume on "Useless Drugs" as well as "Useful Drugs"? What progress we would make and what comfort it would be to us all! A third reason why we have not progressed is because we have failed to keep pace with the times.

If American pharmacy stands indicted because commercialism has destroyed the unity and essential character of our drug stores, and if we fail miserably to keep abreast of the times and so do not progress as we ought, the pharmacist faces a still graver danger, and endangers his profession by his careless attitude towards the medical profession. Specifically, the pharmacist destroys his own profession in proportion as he fails to keep pace with the physician in his knowledge of drugs and chemicals, when he goes from colleague to mere helper or provider. Our knowledge of drugs and chemicals must be kept up to date, be reliable and specific. We must inform the physician, and not have him inform us. We cannot have the physician tell us what it is our business to be informed on in advance. So long as this state of affairs continues we cannot be said to be adequately progressive.

A very good, if not the very best, index of our scientific progress may be obtained by examining the working libraries of our retail drug stores. What do we find here all too often? A dispensatory and a dozen catalogues of various manufacturing houses. Very seldom can we afford to buy both a dispensatory and a pharmacopœia. If the store has been established since the last dispensatory edition came out, then we are duly up to date in this regard; otherwise we are probably behind the times because a new book costs six-odd dollars. Where are our books on chemistry, bacteriology, pharmacology, materia medica, pharmacognosy, and pharmacy? What real scientific information are we ready to give to the physician and the public? How can we possibly progress when we neglect matters so vital?

And, again, the pharmacist fails to adequately progress because of his attitude towards his legitimate work. Let us compare two young men leaving college, one a pharmacist, the other a physician. Both are young, "green," and equally inexperienced. We may grant that in all respects the conditions of these two men are not parallel, and yet their outlook and desire for advancement along

their respective lines ought to be equally great. The young pharmacist becomes the proprietor or manager of a retail store; the physician opens an office. Suppose now that a customer of the former desires to have made a quantitative estimation of sugar in a sample of urine. Chances are at least ten to one that the young pharmacist will tell his customer that he is not equipped to do the work. He has received all the training he needs to do it, but, curiously enough, he will go through some such mental process of reasoning as this: "Now let's see: I didn't do that experiment when I was in college. I haven't any books in which to look up the method. Anyway, I might make a mistake. Moreover, I'm not a chemist, and he had better send it out of town." Oh, the mental deterioration in having things sent away and having somebody else do them for us! A two-dollar book and a burette are all the extra equipment he would need, then a little practice to develop his technic. Now if the problem had been the analysis of a sample of mother's milk, or a well water, or any other problem for which he had received the basal education, although not the specific information required for its solution, he would be positive that it would not do for him to attempt to solve such problems.

Now imagine the young physician being called to see a case. He is sure he has never seen a case of this sort before. But does he say to himself, "I never saw this sort of a case at college; you had better send for some other man"? No; he pitches in, does the best he knows for his patient for the moment, then goes home, reads up on the case, and proceeds to complete the job he was called upon to undertake. By his attitude he has grown mentally; he has become a stronger and better physician; he has been a man of real service to his patient and the community in which he lives. The pharmacist, on the other hand, has weakened mentally, and you can picture him in your mind's eye slowly edging away from his laboratory and gradually moving towards the shelves, counters, and cases that contain the patent medicines, sundries, and cigars.

Now how are we to account for the difference in behavior of these two young men? Who is to blame? Certainly not the individual altogether. We are all to blame. We lack the *esprit de corps* and the confidence we find in the medical profession. A young man enters college imbued with the idea that pharmacy consists in managing a corner drug store as it always has been managed. The university is not strong enough to emancipate him, because too

many of our retail pharmacists refuse to give the future of their profession any thought and so lack the necessary vision. Most of our pharmacists take pride in their profession, and wish to see it grow ever bigger and finer, but they do not act concretely and courageously on the problems that confront it. We must keep ourselves from mental stagnation; we must keep alive; we must think, and think hard. The future demands far more than the present, and we must recognize this and act accordingly. We must organize, not primarily to get more business, to keep grocers from selling patent medicines, although we should insist that all patent medicines on the market be sold by the pharmacist, or to get a corner on the beef, iron, and wine and sarsaparilla trade, but for the scientific advancement of our profession which society demands of us if we are not to lose it. Our schools of pharmacy must increasingly take the lead in this movement, because they can naturally give the problems arising the most time and thought, but their efforts to be of any avail must be seconded and pushed along by the conscientious pharmacists over the country.

And now, we may well ask, what specific things must American pharmacy do to come to its own, to resume its place among the professions, to do one thing only and to do that well, to earn the respect and esteem of both the physician and the public at large? A tentative answer falls under the following three separate heads: First, let the pharmacist keep pace educationally with the physician. Let their preliminary trainings be equal. I am fully aware that this cannot be done at once, but it should be the goal towards which we should work. Secondly, make the professional or technical equipment of the pharmacist as broad as that of the physician, although of a different character. The pharmacist should have a broad and thorough training, first of all, in pharmacy, but also in physiology and experimental pharmacology. He should be especially well grounded in chemistry and bacteriology, so as to be in a position to advise and collaborate with the physician and public health officials in diagnostic and municipal problems requiring chemical and bacteriological technic for their solution. Then and only then can he hope to become the physician's colleague and with him serve society truly for the prevention and elimination of disease. Third, schools of pharmacy must in the future be as courageous as most schools of medicine are at present. (Many of our medical schools have recently reduced the numbers in their classes from hundreds to tens.) To

fill the demands of the commercial market for retail drug clerks must not be their aim, and in this endeavor they should be supported by the retail pharmacist who has his profession at heart. They must concentrate their energies on producing a few highly-trained pharmacists. All honor be to the men and to the schools of pharmacy who are to-day insisting on greater preliminary training as well as more thorough and longer professional preparation. They may be working a hardship on the profession for the moment, but in the long run it is bound to result in good for both the pharmacist and the public at large.

SOME RELATIONS OF PLANTS TO DISTILLED WATER AND CERTAIN DILUTE TOXIC SOLUTIONS.*

By M. C. Merrill.

(*Continued from p. 22, January, 1916.*)

After 40 days in distilled water, whether renewed or unrenewed, the recovery was almost nil, though somewhat better in the renewed, while after 50 days in either renewed or unrenewed distilled water all the cultures were dead.

In the 10 cases furnishing comparisons between cultures in which the full nutrient solution was preceded on the one hand by renewed and on the other by unrenewed distilled water, greater growth was attained in 7 cases where the distilled water was renewed. The total weight of green tops is more nearly equal in the two sets of cultures, however, being 24.20 grams in the case of those in the unrenewed and 22.38 grams in the case of those in the renewed distilled water. We thus see that no injurious effects attend the renewal of the distilled water when compared with the non-renewal of the same; on the other hand, positive benefits are derived from such a renewal, especially in the case of plants approaching the maximum time limit of durability in distilled water—a period which enables the results of the two conditions to be more readily seen and compared.

In pl. 15 fig. 1 some of the cultures are illustrated, the ones of special interest being Nos. 9–14. The exceptionally small or irregular growth of No. 8 is difficult to account for, because in the renewed full

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* Reprinted from *Annals of the Missouri Botanical Garden*, vol. 2, No. 3, pp. 459–498.

nutrient it should be greater than that of No. 7. Individual resistance is apparent, however.

V. Recovery of Plants after being in Toxic Solutions.

Having thus ascertained the maximum time plants may remain in distilled water and then recover on being placed in full nutrient solution, we may turn our attention to toxic solutions. If distilled water in itself is toxic then it should be interesting to get quantitative data on its effects as measured by the power of plants so treated to recover. This power should furnish a good index regarding the extent of any injury suffered. By comparing the ultimate time limits for various media after which recovery in full nutrient solution is possible we are able to get a basis on which to determine the relative toxicity of each medium. Almost simultaneously with series 3, series 4 was set up. The plan of the series and the green weight of tops and dry weight of roots of the plants in series 4 are given in Table VI, while pl. 15 fig. 2 shows the actual condition of the plants in some of the media. The results obtained indicate the following relative toxicities of the substances used, the time expressed in days having reference to the longest period in the toxic solution after which recovery is possible:

Redistilled water	30–40 days
N/100 $MgCl_2$	4–8 days
N/1000 $MgCl_2$	about 20 days
N/1000 $CaCl_2$ and N/20 $MgCl_2$	about 16 days
N/12800 H_2SO_4	about 20 days
N/400 KOH	about 20 days

We thus see that as compared with the toxic solutions mentioned distilled water, if it be considered as a toxic agent at all, is much less so than either of the others given above. In this connection it is interesting to note that Kahlenberg and True ('96) found that N/12800 H_2SO_4 and N/400 KOH were approximately the critical concentrations for Lupinus roots. Hence, the fact that plants can remain much longer in distilled water than in these solutions and still recover would seem to indicate that as regards toxicity distilled water is only very slightly if at all deleterious. But the writer believes that it is entirely incorrect and misleading to speak of distilled water as being toxic. What is illustrated above for distilled water is not toxicity, therefore, but merely the length of time plants can survive in a medium without nutrient materials. That these plants could not survive for that length of time in the other media, however, shows that in those cases a real toxicity enters into consideration.

TABLE VI (Series 4).

Effect on Growth of Plants of Various Periods in Toxic Solutions.

Culture number	First solution or medium	Length of period in first medium days	First medium renewed or unrenewed	Length of period in full nutrient days	Green weight of tops grams	Dry weight of roots grams
1	Dist. H_2O	32	Unrenewed	..	1.15	.116
2	Dist. H_2O	32	Renewed	..	1.55	.130
3	N/100 $MgCl_2$	32	Unrenewed	..	.35	.012
4	N/100 $MgCl_2$	32	Renewed	..	.40	.016
5	N/100 $MgCl_2$	1	Unrenewed	31	10.15	.428
6	N/100 $MgCl_2$	2	Unrenewed	30	8.40	.372
7	N/100 $MgCl_2$	4	Unrenewed	28	5.15	.132
8	N/100 $MgCl_2$	8	Unrenewed	24	.35	.018
9	N/100 $MgCl_2$	12	Unrenewed	20	.30	.020
10	N/100 $MgCl_2$	16	Unrenewed	16	.40	.016
11	N/100 $MgCl_2$	20	Unrenewed	12	.28	.012
12	N/1000 $MgCl_2$	32	Unrenewed	..	1.00	.085
13	N/1000 $MgCl_2$	32	Renewed	..	1.00	.038
14	N/1000 $MgCl_2$	2	Unrenewed	30	8.85	.385
15	N/1000 $MgCl_2$	4	Unrenewed	28	9.70	.384
16	N/1000 $MgCl_2$	8	Unrenewed	24	7.20	.305
17	N/1000 $MgCl_2$	12	Unrenewed	20	5.15	.192
18	N/1000 $MgCl_2$	16	Unrenewed	16	2.05	.121
19	N/1000 $MgCl_2$	20	Unrenewed	12	1.05	.093
20	N/1000 $CaCl_2$ and N/20 $MgCl_2$	32	Unrenewed	..	.75	.092
21	N/1000 $CaCl_2$ and N/20 $MgCl_2$	32	Renewed	..	.85	.099
22	N/1000 $CaCl_2$ and N/20 $MgCl_2$	1	Unrenewed	31	10.60	.409
23	N/1000 $CaCl_2$ and N/20 $MgCl_2$	2	Unrenewed	30	9.35	.388
24	N/1000 $CaCl_2$ and N/20 $MgCl_2$	4	Unrenewed	28	10.35	.384
25	N/1000 $CaCl_2$ and N/20 $MgCl_2$	8	Unrenewed	24	8.40	.294
26	N/1000 $CaCl_2$ and N/20 $MgCl_2$	12	Unrenewed	20	3.00	.144
27	N/1000 $CaCl_2$ and N/20 $MgCl_2$	16	Unrenewed	16	1.50	.117
28	N/1000 $CaCl_2$ and N/20 $MgCl_2$	20	Unrenewed	12	.75	.103
29	Full nutr. sol'n	32	Unrenewed	32	8.95	.411
30	Full nutr. sol'n	32	Renewed	32	18.50	.530
31	N/12800 H_2SO_4	32	Unrenewed	..	1.55	.130
32	N/12800 H_2SO_4	32	Renewed	..	1.25	.124
33	N/12800 H_2SO_4	2	Unrenewed	30	7.05	.318
34	N/12800 H_2SO_4	8	Unrenewed	24	7.45	.289
35	N/12800 H_2SO_4	16	Unrenewed	16	4.40	.236
36	N/12800 H_2SO_4	20	Unrenewed	12	1.95	.172
37	N/400 KOH	32	Unrenewed	..	1.25	.094
38	N/400 KOH	32	Renewed	..	1.50	.108
39	N/400 KOH	2	Unrenewed	30	8.60	.444
40	N/400 KOH	8	Unrenewed	24	6.60	.214
41	N/400 KOH	16	Unrenewed	16	2.55	.092
42	N/400 KOH	20	Unrenewed	12	2.60	.117

In addition to the actual time limits for recovery just tabulated, as well as the method of recovery and delayed maturity mentioned in the preceding section, another interesting point, which was very noticeable in the cultures and which can also be seen in the plates, is the character of growth of the rootlets in the boundary cultures, by which is meant those cultures which have remained in the inimical media nearly as long as their endurance would permit, and whose recovery in full nutrient solution is slower or more difficult than the normal unaffected plants. In the latter case the roots are short and compact and usually extend down only to about one-half the distance to the bottom of the tumbler. In the case of the first mentioned cultures, however, when transferred to full nutrient solution the rootlets develop a long, slender growth easily extending to the bottom of the tumbler.

VI. Effect of Sterilizing the Water During Growth of Plants.

The foregoing series pointed, therefore, to factors other than extraction or loss of solute from the plant tissue as being responsible for the deteriorating phenomenon observed when growing plants are placed in distilled water. In the unrenewed water cultures in the previous series a brownish coloration developed and the roots appeared, in their gelatinized condition, to be covered by bacterial and fungous growths. Suspecting that these organisms played an important rôle, it was decided to grow additional cultures to test this point. Four cultures, each containing ten plants of *Pisum sativum*, were set up in distilled water: in one the medium was not renewed; in a second the water was renewed every four days; and in the remaining two the medium was sterilized every four days by boiling in a return condenser one-half hour. The results are given in Table VII (series 5) and the cultures are shown in pl. 16 fig. 1. The full nutrient solution cultures were grown for purposes of comparison. The duration of growth was 30 days.

Table VII (Series 5).

Effect Produced on Growth of Plants by Sterilizing the Water in which they are Grown.

Culture number	Medium	Condition of medium	Green weight of tops, grams	Dry weight of roots, grams
1	Dist. H_2O	Unrenewed	1.55	.141
2	Dist. H_2O	Renewed	1.65	.150
3	Dist. H_2O	Sterilized	2.40	.225
4	Dist. H_2O	Sterilized	3.05	.233
5	Full nutr.	Unrenewed	10.30	.342
6	Full nutr.	Renewed	17.65	.507

Whether the beneficial effect of the sterilization was due to the destruction of the bacterial and fungous floras of the medium, to a decomposition of any contained toxic substances (thereby rendering them less toxic), or to incidental effects such as aëration of the water by the boiling process, was not definitely determined. Neither was this effect compared with that produced by the addition of various bodies (tannic acid, pyrogallol, calcium carbonate, various hydrates, carbon black, and other substances mentioned by Livingston and his co-workers, '05, '07; Dachnowski, '08, '09, and others). In the last paper of Livingston and his co-workers referred to are given the results of boiling the aqueous extracts from soils containing toxic properties as determined by the growth of plants in the same. The boiling improved the extracts, but this effect was explained by "supposing the process of boiling to remove or change the toxic action of this extract, the toxic materials being perhaps partly volatile with steam." But since in our sterilization process a return condenser was used the removal of toxic substances by volatilization would not occur. A breaking down of toxic compounds into less toxic constituents may possibly be a condition induced by the boiling, however. It will be recalled that Lyon ('04) found the toxicity of tap water reduced by boiling.

While the oxidizing power of roots, due to enzymatic activity, may be an important factor in aiding in the decomposition of vegetable matter in the soil, as pointed out by Schreiner and Reed ('07) and others, it is not believed that in the case under consideration the oxidizing power of the roots was altered to any appreciable degree by the boiling of the medium. Dachnowski ('12) mentions the effect of oxidation upon the toxic substances found in bog water. In the sterilization method by boiling under a return condenser, however, the aëration or oxidation phenomenon would no doubt play only a subsidiary rôle. The stronger line of evidence seems to favor the destruction of injurious bacterial and fungous agencies as the chief factor in the beneficial effect of the sterilization.

VII. Conductivity Measurements.

The excellence of the electrical conductivity method for determining any change in the electrolyte content of an aqueous medium naturally led to its adoption for the experimental work described below. This phase of the investigation was especially concerned with determinations pertaining to the extraction of electrolytes—including

the essential nutrient salts—from the roots of plants in distilled water. The generally beneficial results attendant upon a frequent renewal of the distilled water in which the plants were placed has already been noted, as well as the evidence in favor of the view that conditions other than extraction of essential salts constitute the underlying cause of the deterioration of plants in distilled water.

The next point to be determined was the relative amount of the total exosmosis in the renewed distilled water as compared with that in the unrenewed. In placing roots in distilled water it is pertinent to this subject to inquire whether all the exosmosis occurs during the first four days. If it does, we should have the same amount of extraction in both the unrenewed water and that renewed every four days. Or is there a renewal of the exosmosis of the electrolytes following the renewal of the water each time, thereby giving rise to a greater exosmosis than in the cultures in which the water was not renewed? If such a condition obtains and yet in spite of it the renewal of the water shows no baneful effects, or indeed produces beneficial results, then may we well conclude, and with increasing assurance, that extraction of nutrient salts is in no way responsible for any injury plants undergo in distilled water. The results obtained strongly substantiate that conclusion.

A series of cultures (series 6) was set up in which healthy plants of Canada field peas were grown in full nutrient solution for about three weeks and then transferred, after carefully rinsing the roots, to doubly distilled water. In half of the cultures the distilled water was renewed at certain definite intervals for each culture, while in the other half of the cultures the water was not renewed. Conductivity determinations were then made of the water under both conditions—renewal and non-renewal—at certain regular intervals, varying for each set of cultures, for several days after the plants had been placed in this medium.

By numerous readings it was ascertained that with a resistance of 9110 ohms in the resistance box the average value of x on the Wheatstone bridge for the water in the vessel after being rinsed and before placing the roots therein was approximately 6.0, rarely varying 1 cm. either way. Considering that figure, then, as the basis or the starting point for the exosmosis, and subtracting it from the different values found for the renewed, and from only the final value obtained for the unrenewed distilled water, we get the figures in the last column of Table VIII.

TABLE VIII (Series 6).

Comparative Exosmosis in Renewed and Unrenewed Distilled Water.

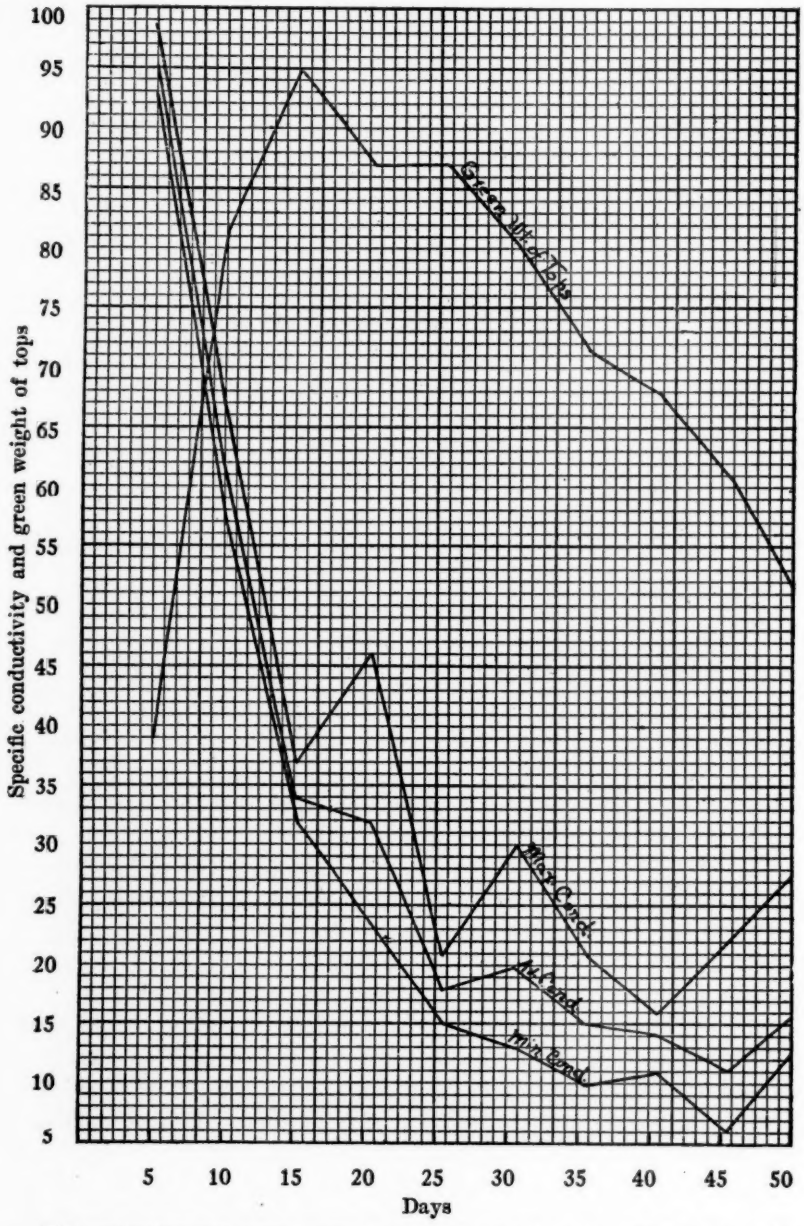
Culture No.	Water renewal	Conductivity readings							Duration of treatment, days	Total increase in conductivity
		Frequency	1st	2nd	3rd	4th	5th	6th	7th	
1	Every day	Every day	32.9	10.4	10.0	8.9	9.7	9.4	10.2	7	49.5
2	None	Every day	36.3	22.8	21.4	17.8	15.2	12.5	11.4	7	5.4
3	Every 2 days	Every 2 days	10.8	9.3	9.6	10.7	...	...	...	8	16.4
4	None	Every 2 days	25.0	14.3	13.6	11.0	...	...	...	8	5.0
5	Every 4 days	Every 4 days	12.9	15.0	16.1	16.1	...	...	...	16	36.1
6	None	Every 4 days	10.7	12.4	15.9	19.5	...	...	...	16	13.5

The plan of the experiment with respect to renewal of the distilled water and the time of readings, the values of the individual readings, and the comparative amounts which represent the total exosmosis of the electrolytes under the various conditions of the experiment are all given in Table VIII. The numbers given are the values of x on the Wheatstone bridge when the resistance inserted in the box was 9110 ohms.

It is thus seen that by far the greater exosmosis was obtained in the case of those cultures in which the distilled water was renewed. Another point of interest was the reabsorption of electrolytes—as seen by the decrease in conductivity of the medium—in those cultures in which the distilled water was not renewed. The reabsorption of electrolytes has been observed to be a phenomenon characteristic of normal, healthy peas, when transferred from a full nutrient solution to distilled water, after being in the latter medium one or two days.

In order to obtain some additional information regarding the relations between the conductivity of the medium and the plants grown therein, series 7 containing 50 cultures was set up in full nutrient solution, ten Canada field pea plants to each culture. The nutrient solution was not renewed. At the end of each five-day period 5 of the cultures were taken down, the green weight of tops of the plants in each determined, and the conductivity of the solution measured; and from these results the average green weight of tops and the average conductivity of each set of 5 cultures were obtained. This was done throughout the entire period of 50 days. The results obtained are given in Table IX and plotted as curves in fig. 1. In the latter the abscissa represents days, and the ordinate both specific conductivity and green weight of tops. The values given for conductivity should be multiplied by 10^{-5} in order to get the specific conductivity values.

FIG. 1.



The conductivity and growth curves for the full nutrient solution (Pfeffer's) in which plants were grown 50 days, the medium being unrenewed. (For complete explanation see the text.)

In the case of the weights the numbers in the margin represent ten times the actual weight in grams, *e.g.*, 40 in the margin = 4.0 grams.

TABLE IX (Series 7).

Growth of Plants and Conductivity of Full Nutrient Medium for 50 Days.

Cultures numbers	Length of period in full nutrient days	Average green weight of tops in each culture, grams	Specific conductivity * at end of period		
			Minimum	Average	Maximum
1– 5	5	3.81	93.22	96.25	98.19
6–10	10	8.12	57.47	61.03	66.93
11–15	15	9.47	32.38	34.83	37.59
16–20	20	8.66	24.38	32.68	46.05
21–25	25	8.69	15.73	18.19	21.69
26–30	30	8.00	13.74	20.63	30.28
31–35	35	7.10	10.02	15.98	21.23
36–40	40	6.77	11.16	14.23	16.19
41–45	46	6.09	6.88	11.44	22.51
46–50	50	5.01	13.00	16.97	28.11

* The numbers in the three columns are to be multiplied by 10^{-5} in order to arrive at the specific conductivity values.

From the results it is seen that both the increase in green weight of tops and decrease in conductivity of the medium are most rapid and pronounced during the first 15 days. After that period both the green weight and the conductivity gradually decline, but the latter more slowly than the former. While the curves of the minimum, average, and maximum conductivity remain very close together during the first 15 days, they become more divergent after that time. The green-weight curve shows a gradual decline as the age of the plant in-

TABLE X (Series 8).

Growth of Plants and Conductivity of Distilled Water Medium for 50 Days.

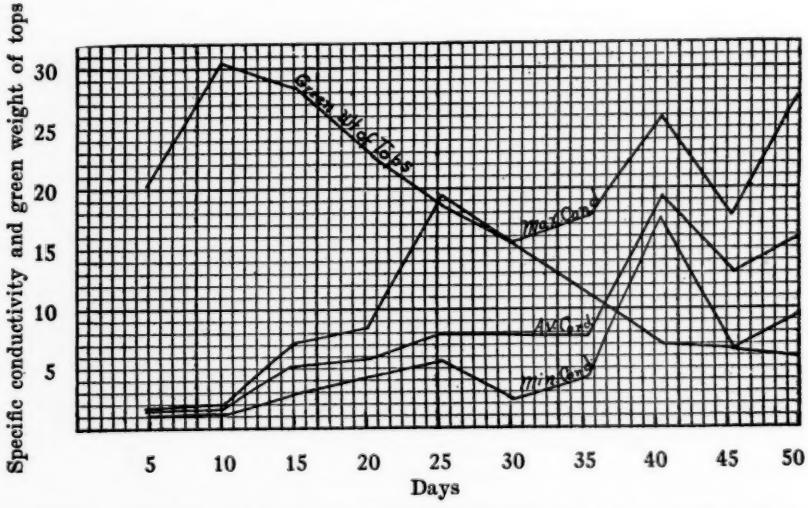
Cultures numbers	Length of period in distilled water, days	Average green weight of tops, grams	Specific conductivity * at end of period		
			Minimum	Average	Maximum
1– 5	5	2.04	1.46	1.54	1.66
6–10	10	3.07	1.01	1.34	1.81
11–15	15	2.89	3.04	5.43	7.41
16–20	20	2.34	4.34	5.92	8.63
21–25	25	1.89	5.66	8.15	19.77
26–30	30	1.55	2.60	8.26	15.82
31–35	35	1.15	4.43	7.80	17.95
36–40	40	.72	17.62	19.51	26.04
41–45	45	.68	6.87	13.32	17.95
46–50	50	.60	10.51	16.48	29.00

* The numbers in the three columns are to be multiplied by 10^{-5} in order to arrive at the specific conductivity values.

creases, after a certain period, due to the drying of the tops and consequent loss of water. Different curves would, of course, have been obtained had the nutrient solution been renewed.

In Table X and fig. 2 are seen the results of series 8, a similar experiment with distilled water, the same units being used as in the previous case The green weight of tops increased during the first 10 days and then gradually declined to the end of the experiment. The conductivity of the water was practically the same on the 10th as it had been on the 5th day. Evidence from other experiments, however, indicates that in the interim the curve might have risen and

FIG. 2.



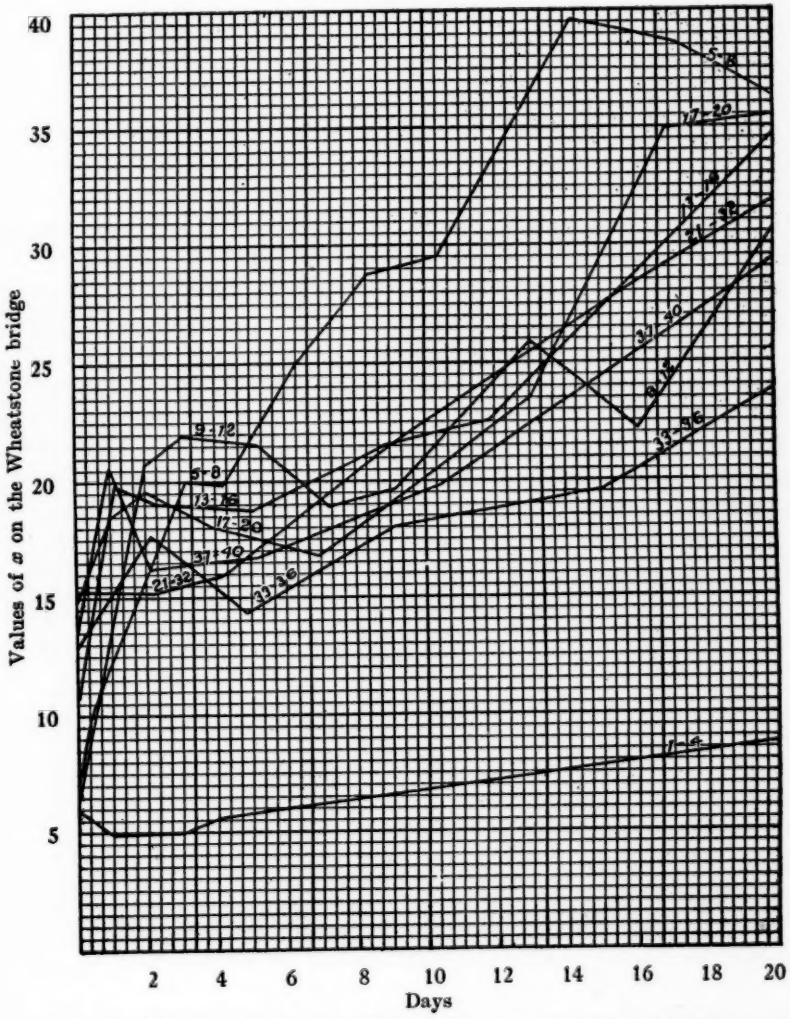
The conductivity and growth curves for the unrenewed redistilled water in which pea seedlings were grown for 50 days. (For complete explanation see the text.)

fallen. After the 10th day the curve inclined with fluctuations. Here again are seen evidences that the 10-day period for seedlings in the distilled water may properly be considered a crucial one for the plants. After that time the growth declines and the conductivity increases markedly.

Suspecting that the question of injury to plants in distilled water might be intimately bound up with that of lack of reserve food materials, the writer carried out an experiment bearing upon this matter. The experiment consisted, first, in placing some Canada field pea seedlings directly into redistilled water and determining the specific conductivity of the water at intervals for 20 days; and,

next, in transferring some pea plants which had been grown in full nutrient solution for 1, 5, 10, 20, 30, and 40 days, respectively, to redistilled water, and determining the specific conductivity of the water at intervals for 20 days. The results are plotted as curves in

FIG. 3.



The conductivity curves for cultures in distilled water 20 days—after growth in full nutrient solution for varying periods of time, as follows: Nos. 9–12, 1 day; Nos. 13–16, 5 days; Nos. 17–20, 10 days; Nos. 21–32, 20 days; Nos. 33–36, 30 days; Nos. 37–40, 40 days. Nos. 5–8 were grown only in distilled water, while Nos. 1–4 were without plants, consisting only of distilled water.

fig. 3, the conductivity values being represented in terms of x on the Wheatstone bridge with a resistance of 9110 ohms in the box. Four cultures of 10 plants each (except in the case of the 20-day period in full nutrient solution in which 12 cultures were used) were grown under each of the specified conditions, and the curves represent the averages for the 4 (or 12) cultures under each condition. To determine how much increase in conductivity was contributed by the glass tumblers in which the cultures were grown, 4 such containers filled only with redistilled water, and containing no plants, were used and the conductivity of the water determined at intervals for 20 days. It is seen that from the seedlings which had not been in full nutrient solution at all (Nos. 5–8) the highest conductivity resulted, while from those which were in the full nutrient solution longest before being placed in the distilled water (Nos. 37–40 and 33–36) the lowest conductivity was found at the end of 20 days. The other cultures at the end of 20 days were midway between the two extremes. It is also seen that, whereas the conductivity curve for Nos. 5–8 shows very little tendency to decline in the early stages, the curves for the cultures which had first been in full nutrient solution show that tendency to a considerable extent. And that tendency, as we have previously remarked, is a characteristic feature of normal plants transferred from full nutrient solution to distilled water.

Attention should be called to the difference in the character of the conductivity curves in fig. 2 and that of 5–8 in fig. 3.

(To be continued.)

ANNUAL REPORT OF THE INTERNATIONAL COMMITTEE ON ATOMIC WEIGHTS, 1916.*

Although many scientific activities have been interrupted by the European war, a fair number of atomic-weight determinations have appeared since the report for 1915 was prepared. They are, briefly, as follows:

Carbon.—Richards and Hoover[1] neutralized sodium carbonate with hydrobromic acid which had been standardized against silver.

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* Reprinted from the *Journal of the American Chemical Society*, vol. xxxvii, No. 11, November, 1915, p. 2449.

[1] *Jour. Amer. Chem. Soc.*, **37**, 95.

In this way the ratio of carbonate to silver was determined. With Ag = 107.88, Br = 79.916, and Na = 22.995, C = 12.005.

Sulfur.—Atomic weight also determined by Richards and Hoover,[2] who measured the ratio between sodium carbonate and sulphate. With the values previously assigned to sodium and carbon, S = 32.060.

Iodine.—By the direct analysis of iodine pentoxide, Guichard [3] finds I = 126.92.

Copper.—The electrolytic ratio between copper and silver has been remeasured by Shrimpton,[4] with Ag = 107.88, Cu = 63.563, as the mean of ten determinations.

Nickel.—Oechsner de Coninck and Gerard,[5] by reduction of nickel oxalate in hydrogen, find Ni = 58.57. Few details are given.

Cadmium.—By the electrolysis of cadmium chloride Baxter and Hartmann [6] find Cd = 112.417. This confirms the earlier work of Baxter and his colleagues, and gives cadmium a much higher value than was found by Hulett.

Mercury.—By the synthesis of mercuric bromide Baker and Watson [7] find Hg = 200.57, when Br = 79.92. This value is near that found by Easley.

Lead.—By the analysis of lead bromide Baxter and Thorvaldsen [8] find Pb = 207.19. With the chloride, Baxter and Grover [9] obtained the value 207.21, and with the bromide, 207.19. These determinations were made with *normal* lead from widely-separated and dissimilar sources, and are highly concordant.

The value Pb = 207.20 will be adopted in the table of atomic weights.

Lead from radioactive minerals, however, has been found to differ in atomic weight from ordinary lead. For lead from thorite Soddy and Hyman [10] found atomic weights ranging from 208.3 to 208.5. Maurice Curie [11] studied lead from pitchblende, carnotite, and

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[2] *Jour Amer. Chem. Soc.*, **37**, 108.
[3] *Compt. rend.*, **159**, 185.
[4] *Proc. Phys. Soc. London*, **26**, 292.
[5] *Compt. rend.*, **158**, 1345.
[6] *Jour. Amer. Chem. Soc.*, **37**, 113.
[7] *J. Chem. Soc.*, **107**, 63.
[8] *Jour. Amer. Chem. Soc.*, **37**, 1021.
[9] *Ibid.*, **37**, 1027.
[10] *J. Chem. Soc.*, **105**, 1402.
[11] *Compt. rend.*, **158**, 1676.

International Atomic Weights, 1916.

	Symbol	Atomic weight
Aluminum	Al	27.1
Antimony	Sb	120.2
Argon	A	39.88
Arsenic	As	74.96
Barium	Ba	137.37
Bismuth	Bi	208.0
Boron	B	11.0
Bromine	Br	79.92
Cadmium	Cd	112.40
Caesium	Cs	132.81
Calcium	Ca	40.07
Carbon	C	12.005
Cerium	Ce	140.25
Chlorine	Cl	35.46
Chromium	Cr	52.0
Cobalt	Co	58.97
Columbium	Cb	93.5
Copper	Cu	63.57
Dysprosium	Dy	162.5
Erbium	Er	167.7
Europium	Eu	152.0
Fluorine	F	19.0
Gadolinium	Gd	157.3
Gallium	Ga	69.9
Germanium	Ge	72.5
Glucinum	Gl	9.1
Gold	Au	197.2
Helium	He	4.00
Holmium	Ho	163.5
Hydrogen	H	1.008
Indium	In	114.8
Iodine	I	126.92
Iridium	Ir	193.1
Iron	Fe	55.84
Krypton	Kr	82.92
Lanthanum	La	139.0
Lead	Pb	207.20
Lithium	Li	6.94
Lutecium	Lu	175.0
Magnesium	Mg	24.32
Manganese	Mn	54.93
Mercury	Hg	200.6
Molybdenum	Mo	96.0
Neodymium	Nd	144.3
Neon	Ne	20.2
Nickel	Ni	58.68
Niton (radium emanation)	Nt	222.4
Nitrogen	N	14.01
Osmium	Os	190.9
Oxygen	O	16.00
Palladium	Pd	106.7
Phosphorus	P	31.04
Platinum	Pt	195.2
Potassium	K	39.10
Praseodymium	Pr	140.9
Radium	Ra	226.0
Rhodium	Rh	102.9
Rubidium	Rb	85.45
Ruthenium	Ru	101.7
Samarium	Sa	150.4
Scandium	Sc	44.1
Selenium	Se	79.2
Silicon	Si	28.3
Silver	Ag	107.88
Sodium	Na	23.00
Strontium	Sr	87.63
Sulfur	S	32.06
Tantalum	Ta	181.5
Tellurium	Te	127.5
Terbium	Tb	159.2
Thallium	Tl	204.0
Thorium	Th	232.4
Thulium	Tm	168.5
Tin	Sn	118.7
Titanium	Ti	48.1
Tungsten	W	184.0
Uranium	U	238.2
Vanadium	V	51.0
Xenon	Xe	130.2
Ytterbium (Neoytterbium)	Yb	173.5
Yttrium	Yt	88.7
Zinc	Zn	65.37
Zirconium	Zr	90.6

yttrotantalite, and obtained values from 206.36 to 206.64. Lead from monazite and galena was more nearly normal. Hönigschmid and Horowitz [12] studied lead from pitchblende, and by analyses of the chloride found Pb = 206.735. Richards and Lembert [13] made six series of analyses of lead chloride prepared with lead derived from carnotite, thorianite, pitchblende, and uraninite, the mean values being Pb = 206.59, 206.81, 206.83, 206.57, 206.86, and 206.36. These figures, although each series is concordant within itself, show that radio lead is variable in its atomic weight, and that the single, definite metal is yet to be completely isolated. Indeed, the relations between radio lead (or leads) and ordinary lead are still obscure.

Tin.—Briscoe,[14] by analyses of the tetrachloride $SnCl_4$ finds Sn = 118.70, when Ag = 107.88 and Cl = 35.457. This new value, which was determined with all modern precautions, will be adopted in the table.

Tantalum.—Sears and Blake,[15] in a preliminary series of determinations of the ratio between $TaCl_5$ and Ag, obtained values for Ta ranging between 180.90 and 182.14. The research is to be continued.

Praseodymium.—Baxter and Stewart,[16] in a long series of concordant analyses of the chloride $PrCl_3$, find Pr = 140.92. The rounded-off figure 140.9 will be adopted here.

Ytterbium.—Blumefeld and Urbain,[17] in a series of analyses of the sulphate $Yb_2(SO_4)_3.8H_2O$, find Yb = 173.54. This may be rounded off to 173.5.

Uranium.—Hönigschmid,[18] from analyses of the bromide UBr_4, finds U = 238.18. The value 238.2 may properly be adopted.

At the meeting of the International Congress of Applied Chemistry, in 1912, a resolution was passed favoring delay in changes in the table of atomic weights. In accordance with the desire so expressed, no changes have since been made, but several now seem to be necessary. These relate to C, S, He, Sn, Pb, Ra, U, Yt, Pr, Yb, Lu, and U. The reasons for the changes, which are small, may be

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[12] *Z. Electrochem.*, **20**, 457.
[13] *Jour. Amer. Chem. Soc.*, **36**, 1329.
[14] *J. Chem. Soc.*, **107**, 63.
[15] *Jour. Amer. Chem. Soc.*, **37**, 839.
[16] *Ibid.*, **37**, 516.

found in this and the three preceding reports. They are based upon new determinations, which seem to be better than the old.

(Signed) F. W. CLARKE,
T. E. THORPE,
W. OSTWALD.

NOTE.—Professor Urbain, because of an official connection with the military service of France, is debarred from signing any international report during the war. Otherwise he would approve this report. F. W. C.

CORRESPONDENCE.

PROCTER MEMORIAL.

At the meeting of the American Pharmaceutical Association in 1913 the Committee on the William Procter, Jr., Monument Fund reported that it had collected the necessary funds for the erection of a monument in accordance with the preamble and resolutions adopted by the Association at its annual meeting in Kansas City in 1904. The committee was instructed to take preliminary steps and make arrangements for space and the erection of the monument in the Smithsonian ground at Washington, D. C., by the time of the centennial of the birth of William Procter, Jr., the Father of American Pharmacy, in 1917. A model has been submitted by a sculptor of repute and a bill has been introduced in Congress by the Hon. J. Charles Linthicum, of Maryland, to provide for the erection of a pedestal and a base for the statue in the Smithsonian grounds at Washington, D. C. The bill, known as H. R. 8932, reads as follows:

"A BILL

"To provide for the erection of a pedestal and base for a monument to William Procter, junior, in the Smithsonian grounds, at Washington, District of Columbia.

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That the sum of $2000, or so much thereof as may be necessary, is hereby appropriated, out of any money in the Treasury not otherwise appropriated, for the erection in the Smithsonian grounds, in the city of Washington, District of Columbia, under the direction of the Secretary of War, of a pedestal and base for a monument in memory of William Procter, junior.

"In the preparation of the plans and the selection of a site for said monument and the execution of all work in connection there-

with the Secretary of War shall form a committee, with whom he may confer, composed of Doctor John F. Hancock, Doctor Charles Caspari, junior, James E. Hancock, and Parker Cook, comprising the William Procter, junior, monument fund committee of the American Pharmaceutical Association, and two other persons to be designated by the Secretary of War: *Provided, however,* That the decision of the Secretary of War shall be final in all matters connected with this work: *Provided further,* That the said monument, pedestal, and base shall not be erected until the design and site selected therefor shall have been approved by the Commission of Fine Arts: *And provided further,* That the money herein appropriated shall be drawn from the Treasury and disbursed as needed, in the progress of the work, by the Secretary of War or his duly appointed representative."

HENRY T. HELMBOLD.

Editor of the AMERICAN JOURNAL OF PHARMACY:

I have read with much interest the article published on Helmbold, "The Buchu King." I remember quite well his splendid coach with its "four-in-hand" team, their harness resplendent with gold plate, and the scarlet-coated footmen. One of the things which impressed me at the time that Helmbold's preparations were the "best sellers" was the liberality with which the striking gold signs were distributed.

These signs were triangular in shape, about three feet on a side, with gold leaf most liberally displayed upon them. The picture upon them represented the gathering of Helmbold's buchu by the natives in South Africa; a lot of Hottentots were pictured as cutting down large quantities of monocotyledonous plants resembling rushes. To those who knew the botanical characters of buchu the sign was ridiculous, for buchu is a dicotyledonous shrub, with ovate leaves less than an inch in length. I suppose, however, that in most cases it exemplified the saying, "Where ignorance is bliss, 'tis folly to be wise"; but what of Helmbold's botanical knowledge?

The doctor, or some one in his employ, well understood what the character of a good preparation of buchu should be like, and that alcohol is contra-indicated in kidney troubles, therefore, the alcoholic strength of the preparation was made as low as possible. The preparation was remarkably efficient, and, owing to its efficiency and remarkable advertising, had a phenomenal sale.

A reference to Dr. Jayne recalled to my mind that I have frequently heard a great aunt of mine, who resided at one time in Woodstown, N. J., speak of Dr. Jayne's father. He occasionally stopped to get a meal, and, as he was very poor, his costume was simplicity itself, consisting of a tow shirt, pair of pants suspended by one "gallus," and a straw hat, *sans* stockings, *sans* shoes. His son (Dr. Jayne), who was a young man of remarkable push and energy, came to Philadelphia and by means of a small amount of borrowed capital amassed a great fortune. I have been told that some time in the early sixties he had his almanac translated into Chinese and circulated in that country. A few months afterwards he received an order from China for $10,000 of his medicines. While debating in his mind the advisability of filling the order, a draft came to hand in gold. Before this order could be filled an order came to hand for $100,000 worth, with a gold draft for the same. Dr. Jayne made money so rapidly that he went to the president of the Chestnut Street bank where he deposited and consulted him as to how he had best invest his money. The president of the bank said to him: "Dr. Jayne, you own a large amount of property, much of which is mortgaged; why don't you invest in these mortgages?" The advice was taken, the mortgages were all paid off, the last one only a short time before his death; the result was that the administration of his vast estate was comparatively simple. The following story is told of the introduction of Jayne's Hair Tonic: After the formula had been perfected Dr. Jayne tried it on his own head, which needed renovation badly. To his surprise and delight it caused the growth of a quantity of fine hair; he immediately advertised widely, "Come and see Dr. Jayne's new head of hair." The people came, and saw, and purchased, so that the preparation had quite a boom. A short time after, however, the new hair all fell out, and the invitation had to be taken out of the papers, but the preparation had been so well introduced that it continued to sell.

C. B. Lowe.

AMERICAN PHARMACEUTICAL ASSOCIATION.

Pharmaceutical Philadelphia, on the evening of January 11, opened wide her arms and extended a most hearty welcome to Dr. Eugene G. Eberle and the *Journal of the American Pharmaceutical Association,* of which he is the editor. It was a welcome to the dis-

tinguished pharmacist through which ran an undercurrent of satisfaction that Philadelphia was chosen as the home of the publication of the premier pharmaceutical organization of the country.

Representatives of every pharmaceutical organization in the city and State, as well as of the Philadelphia Chamber of Commerce, were assembled about the banquet board at the Hotel Rittenhouse to tell of their appreciation of the new honor that had come to the city, already so rich in pharmaceutical history, and of their pleasure in having with them again the man who, since he said good-bye to his Alma Mater here away back in the eighties, had done so much for pharmacy and its representatives.

Professor Eberle, who with Mrs. Eberle and their niece, Mrs. Galbraith, were the guests of the evening, was quite overwhelmed by the warmth of greeting by these old and new friends. When called upon to respond, Professor Eberle declared that all his thoughts had fled and that he could do little more than thank them all for this welcome and their many expressions of friendship and assurances of coöperation.

Not alone were these felicitations from the representatives of pharmacy, for equally hearty was the welcome of the representatives of medicine and of the business and commercial life of the city. Friends and organizations in other cities by letter and by telegram conveyed their well-wishes to Editor Eberle in commencing his work in this city.

The dinner and reception were arranged by a committee of the Philadelphia Branch, and the attendance was most representative of the interests with which Professor Eberle will be associated in his work here.

Following the dinner, a brief business session was held by the Branch, in the course of which Charles Holzhauer, of Newark, N. J., local secretary for the 1916 convention of the American Pharmaceutical Association at Atlantic City, suggested that the New York and the Philadelphia Branches of the parent organization, with the New Jersey Pharmaceutical Association, take separate days for entertainment features rather than to try to unite in arranging that portion of the program. He was of the opinion that bringing the ladies to Philadelphia on one day for a tour of its places of historical interest, and then having the men come up on another day and visit some of the manufacturing plants identified with the drug trade, would be most gratifying to the visitors as Philadelphia's portion of

the entertainment. When he suggested the appointment of a committee of five, with the local president an *ex-officio* member, to coöperate in the furtherance of these suggestions, a motion to that effect was carried unanimously.

Samuel C. Henry, the president of the Philadelphia Branch, acted as toastmaster, and in his opening remarks spoke of the gratification of the Philadelphia pharmacists that their city had been made the home of the *Journal of the American Pharmaceutical Association,* and described the present occasion as a big family gathering at which those present wished to express some of the thoughts that lie upon their hearts in having Dr. Eberle, the personal representative of the honor that has come to the local pharmacists and to Philadelphia.

The office of the *Journal* has been established in the rooms of the Philadelphia Drug Exchange, and the first speaker, John Fergusson, president of that time-honored organization, spoke in a humorous vein of the many new evidences of bustle and energy that were apparent since Editor Eberle had been installed there on January 1. On behalf of his organization, which includes the manufacturing and wholesale interests of the city and vicinity, Mr. Fergusson extended a most hearty welcome, and expressed the hope that in its new atmosphere and surroundings the *Journal* and its field of usefulness would be broadened and enhanced in value, and that the guest of the evening would be spared to direct its progress for many years to come.

In speaking for the Chamber of Commerce, Howard B. French, who is the president of the Philadelphia College of Pharmacy, declared that during the forty-nine years he had been connected with pharmacy he had found the representatives of the profession proverbially modest. He said that they, like Philadelphia, were entitled to stand in the foremost rank. In conveying the welcome of the city through the Chamber of Commerce, Mr. French stated that it was "the greatest city on God's earth, and there is more home comfort to the square inch in our city than on any other spot on the globe." He spoke of the proposed plan to have the delegates at the 1916 convention visit this city, and pledged the coöperation of the Chamber of Commerce, which, with its 5000 members, "is the strongest commercial organization in the world."

Dr. S. Solis Cohen, of Jefferson Medical College, and Dr. Henry Beates, Jr., of the University of Pennsylvania, agreed that both the

medical and pharmaceutical professions would be strengthened by this valuable acquisition to Philadelphia's institutions.

The toastmaster facetiously introduced the next speaker, Joseph P. Remington, as the "oldest living pharmacist and the man who founded the Philadelphia College of Pharmacy." Professor Remington referred with pride to the fact that there were eight members of the Board of Revision of the United States Pharmacopœia present. In referring to the assistance which that committee of which he is the chairman had received from other organizations, he mentioned particularly the National Association of Retail Druggists and its accomplishments along propaganda lines. He spoke of his long acquaintance with Professor Eberle, dating from the time the latter was a student in the Philadelphia College of Pharmacy, and in closing shook hands with his former pupil and said: "I have a particular pleasure in welcoming you back to the city of which, I know, you have many pleasing recollections."

Dr. Julius W. Sturmer, dean of the Department of Pharmacy of the Medico-Chirurgical College, told of the warm welcome and coöperation that had been extended to him when, a few years ago, he, like Professor Eberle, had come to Philadelphia to take up educational work. Mentioning the physical resemblance between the guest of the evening and himself, he referred humorously to an occasion when he was mistaken for the editor of the *Journal*. He declared, therefore, that in welcoming his distinguished friends he did so with particular pleasure and a sense of possible reflected glory.

Dr. John R. Minehart, dean of the Department of Pharmacy of Temple University, urged that educators in pharmaceutical colleges be impressed with the debt that pharmacy owes the American Pharmaceutical Association, and that they carry that impression along to the students in their classes.

And then came an ovation for Professor Eberle as Toastmaster Henry formally introduced him again to this gathering of warm friends. Declaring that the pangs due to the severing of the ties that had bound him to his good friends in Texas for thirty years were partly softened by the pleasure of being welcomed so warmly by his friends in Philadelphia, he said in part:

"We have come here not because we wished to, but because the association said it was my duty. I hope I did not make a mistake and that I will be able to fulfil all of the wishes of the association. The *Journal* needs the help of every member of the association. And I

feel that with the help that you have so generously proffered me, the membership of the association should be greatly increased everywhere, but particularly in and about Philadelphia. I have in mind a few changes in the *Journal,* some of which will be made in the forthcoming issue. I hope they will be welcome."

He closed with a plea for continued advice and assistance for himself and his work from his Philadelphia friends, to whom he felt so close by meeting them that night.

Mrs. L. Galbraith, of Galveston, Texas, a niece to Professor and Mrs. Eberle, acknowledged the warmth of northern hospitality as evidenced on the present occasion. When Professor Remington humorously asked for an expression of her political affiliations, Mrs. Galbraith emphatically asserted her faith in the policies of the Republican party, and explained that because she came from the South it did not follow that she was a Democrat.

Toastmaster Henry, who has long been known for his belief in Jeffersonian principles, smilingly declared that that was the reason he had assigned to Professor Remington the honor of introducing Mrs. Galbraith.

The meeting closed with the reading of communications conveying to Editor Eberle the well-wishes in the new field from Professor Otto Raubenheimer, of Brooklyn; Mr. and Mrs. John G. Godding, of Boston, Mass.; Joseph L. Lamberger, of Lebanon, Pa.; Casewell A. Mayo, of New York, and the New York Pharmaceutical Association.

A vote of thanks was tendered the Committee on Reception, consisting of E. Fullerton Cook, chairman; S. C. Henry, J. R. Minehart, and J. W. Sturmer.

Professor Eberle transferred the scene of his editorial duties to Philadelphia, January 1, in accordance with the action of the Committee on Publication of the American Pharmaceutical Association in selecting Philadelphia after it had been accorded power to act on this question of the *Journal's* future home at the annual meeting in San Francisco last year.

Coming to Philadelphia in 1881 to attend the Philadelphia College of Pharmacy, he worked in the drug store of Charles Shivers, then at the northeast corner of Seventh and Spruce Streets. Soon after graduation, in 1884, he located in Texas. Becoming interested in educational work, he founded the School of Pharmacy of Baylor University at Dallas, later becoming its dean. He was also the

founder and editor of the *Southern Pharmaceutical Journal.* He became editor of the *Journal of the American Pharmaceutical Association* in April, 1915.

PHILADELPHIA COLLEGE OF PHARMACY.

MINUTES OF THE QUARTERLY MEETING.

December 27, 1915.—The quarterly meeting of the Philadelphia College of Pharmacy was held this day, at 4 P.M., in the library, the President, Howard B. French, presiding. Fourteen members were present. The minutes of the semi-annual meeting held September 27 were read and approved. The minutes of the Board of Trustees for September, October, and November, were read (in the absence of the Registrar) by Joseph W. England, and approved.

Mr. French reported that it was necessary for the College, under the Employer's Liabilities Act, to take out insurance for all those who were receiving compensation from the College. There was much detail work necessary to do this, although the expense was not great. In the discussion that followed this announcement, participated in by Messrs. England, Evans, French, Poley, and Remington, much valuable information was given.

Professor Kraemer spoke of the changes made in the display in the Museum since the last meeting of the College and what had been accomplished. There was still much to do, and he hoped for the coöperation and assistance of the various committees and members so that the College could offer an exhibit that would attract not only pharmacists but also the general public.

The President announced the death, on October 19, 1915, of Joseph A. Heintzelman. He had been an active member of the College since 1859, a period of fifty-six years.

Professor Remington reported the death, on November 28, 1915, of Samuel A. D. Sheppard, of Boston, Mass., long identified with pharmacy. The College conferred the degree of Master in Pharmacy on him in 1908.

The President reappointed the Committee on Legislation, as follows: Theodore Campbell, chairman; William L. Cliffe, Samuel C. Henry, Richard H. Lackey, Warren H. Poley, and Joseph P. Remington.

C. A. WEIDEMANN, M.D.,
Recording Secretary.

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

October 5, 1915.—Twelve members present. A communication was received from the Secretary of the College, announcing the election of Samuel C. Henry, O. W. Osterlund, and Aubrey H. Weightman to membership in the Board of Trustees for the ensuing three years.

The Committee on Scholarships reported the applications of twenty-five students were under consideration. They recommended the award of scholarships to twelve students, viz., seven to first-year, three to second-year, and two to third-year students.

The Committee on Examinations reported the names of Sylvan Loraine Foster, Howard J. Koch, and Max M. Waxman, who had successfully passed the required examinations and were entitled to receive the Certificate of Proficiency in Chemistry. Also that Louis George Linford had completed the course in Food and Drug Analysis and is entitled to a Certificate. Also that Carlos Maria Aguiar had completed a Special Course in the Department of Analytical Chemistry and is entitled to a Certificate of Analyst of Agricultural Products. The proper certificates were accordingly awarded.

A communication was received from the Board of Public Education naming three students of different high schools to whom they suggested that scholarships in the College be awarded.

The annual report of the Treasurer for the fiscal year ending August 31, 1915, was read and referred to the Committee on Accounts and Audit.

November 3, 1915.—Sixteen members were present. The amendments to Section 6, Article 8, of the By-Laws, relating to practical experience and previously submitted, were, on motion, adopted.

The Committee on Examinations reported that John J. Over had successfully passed the required examination and was entitled to receive the Certificate of Proficiency in Chemistry. The certificate was accordingly awarded.

The Committee on Museum and Herbarium made a verbal report, through Mr. Osterlund, relative to proposed changes in the exhibit in the Museum suggested by Professor Kraemer at the September meeting of the College, and asked for an appropriation to put up additional shelving. Mr. French quoted from the minutes

of the Committee on the 50th Anniversary of the Alumni Association, giving additional information, when, on motion, the report was received and the matter of appropriation and shelving referred to the Committee on Property.

The Dean read a communication from Mr. H. O. Parrish, grandson of the late Professor Edward Parrish, relative to a copy of Parrish's Pharmacy. As the College possessed several copies, Mr. French moved that the Dean be authorized to present a copy to Mr. Parrish. So ordered.

The Dean read a communication from Professor E. F. Cook, relative to the increased work in the Department of Operative Pharmacy, occasioned by the new roster, and asked that the selection of John R. Graham, a third-year student, as student assistant, be approved. So ordered.

Mr. England referred to the communication of Miss Nagle, the librarian, in reference to procuring positions for woman students, and mentioned some of the difficulties connected with the matter. Mr. Osterlund referred to the present law governing the State Board of Pharmacy, and Mr. Henry said that the incoming Legislative Committee, appointed at the last meeting of the Pennsylvania State Association, was instructed to take up this matter with the view of having the law modified to meet present conditions. Mr. Mulford favored including manufacturing laboratories as equivalent experience for a degree, when Mr. England presented the following resolution, which was, on motion, adopted:

Resolved, That the Board of Trustees of the Philadelphia College of Pharmacy favor the amendment of the State Pharmacy Law to provide that the pharmaceutical experience of hospital pharmacies and manufacturing pharmaceutical establishments shall be regarded as the equivalent of pharmaceutical experience of retail drug stores in the application for examination for registered pharmacists and qualified assistants under the State Pharmacy Law; and that the Committee on Legislation of the Philadelphia College of Pharmacy be requested to coöperate with the Committee of Legislation of the Pennsylvania Pharmaceutical Association and similar committees representing other bodies to take proper action looking towards the amendment of the State Pharmacy Law.

An application was received for active membership, which was referred to the Committee on Membership.

December 7, 1915.—Fifteen members were present. The Committee on Museum and Herbarium reported that commendable

progress was being made in rearranging the cases and relabelling the specimens.

The Committee on Accounts and Audit reported they had examined the accounts of the Treasurer, Registrar, and Committee on Publication and found them correct.

The Committee on Scholarships reported that a competitive examination had been held for the Dobbins Scholarship, and of the seven who took it, George R. Mangan, of Salem, N. J., received the highest average, and they therefore recommended that the scholarship be awarded to Mr. Mangan. So ordered.

The Committee on Examinations reported that George W. Tucker had successfully passed the required examination in Analytical Chemistry and was entitled to receive the Certificate of Proficiency, which was, on motion, awarded.

The Committee on Alumni reported the action taken by the Executive Board of the Alumni Association relative to the Pennsylvania Alumni Scholarship, which, after discussion, was, on motion, adopted.

The Sub-coommittee on Athletics reported that 112 students had applied for Y. M. C. A. membership, of which number twelve were for full privileges, the others taking the optional plan.

The Committee on Membership reported favorably on the application of Ivan R. Fuss, of Class 1915, for active membership. The candidate was balloted for and unanimously elected.

The question of indemnity insurance came up and was referred to the Committee on Property.

Dean Remington referred to the calendar sent out to our Alumni in 1915 and the good he felt it did, and asked the opinion of the Board as to sending one in January, 1916. The idea met with general approval, and, on motion, the Dean was authorized to arrange for the printing and distribution of 5000 calendars, and that a letter accompany each.

The Dean spoke of a letter received from Mr. Wood, General Secretary of the Y. M. C. A., acting as secretary for the Association among colleges, stating that since the war the Association had been hunting up foreign students, not naturalized, in order to be of assistance to them. The Dean asked if there was any objection to giving Mr. Wood the names of foreign students attending the College, when, on motion of Mr. French, the Dean was authorized to furnish the names of such students.